RESEARCH AND DEVELOPMENT, NEUCHATEL - QUARTERLY REPORT

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PROJECT CHISEL - NO 8501

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Objective

To investigate the influence of tobacco rod compacity on mainstream and sidestream deliveries including puff by puff profiles.

Status

To determine the filtration coefficient of the tobacco rod, cigarettes were made at three different compacities and two different rod lengths. As additional parameter, two cigarette papers were used at different permeability levels (WP 60 = 50 CU and E13146 = 22 CU).

The cigarettes were weight selected at $\pm$ 15 mg and smoked in the Smoke Laboratory (routine) and in Research Division for the determination of delivery per puff (profiles) of DPM, SN and CO.

Results

To determine the filtration coefficient u (diffusion coefficient D for gaseous smoke components) the ignition puff and the last puff were not considered.

The puffs between were correlated in the following manner :

$$\ln Y_i = -\mu \times butt_i + \ln A$$

where

Y_i = yield for puff i of smoke component Y [mg]

$butt_i$ = butt length acting as filter for puff i [mm]

μ = filtration coefficient

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Remarks

The butt length was not measured, it was determined from the number of puffs and the total length smoked. The sequence (puff plus smouldering period) was considered as constant during smoking.

At the moment, only profiles of long cigarettes (100 mm / filter 21 mm) were available.

Cigarette paper WP 60 (50 CU air permeability)

Tob. density	Firmn.	μ_{DPM}	μ_{SN}	D_{CO}
[mg/ml]	[mm]	[1/mm]	[1/mm]	[1/mm]
246	3.47	0.0105	0.0130	0.0137
278	2.71	0.0115	0.0148	0.0131
290	2.41	0.0142	0.0163	0.0155

Cigarette paper E13146 (22 CU air permeability)

Tob. density	Firmn.	μ_{DPM}	μ_{SN}	D_{CO}
[mg/ml]	[mm]	[1/mm]	[1/mm]	[1/mm]
249	3.38	0.0083	0.0098	0.0095
277	2.58	0.0094	0.0118	0.0083
292	2.37	0.0110	0.0126	0.0077

Conclusions

For equal tobacco density the cigarette paper E13146 gives slightly better firmness values.

We can observe the expected increase of the filtration coefficient for DPM and SN when increasing tobacco rod compacity.

The filtration coefficients determined this way are influenced by several parameters :

- Filtration of the tobacco column itself
- Dilution of the smoke behind the burning cone through the paper
- Higher puff volume as the cigarette paper surface decreases with each puff (less air entering through the cigarette papers)
- Redistillation of condensed and filtered smoke on the tobacco column.

For this reason the cigarettes made with the paper having lower permeability gave systematically lower "filtration coefficients".

The coefficients found for DPM are always lower than those for Nicotine (SN). This is the contrary of values reported in the literature (ref. 1 and 2).

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This may be due to the method of determining the DPM by spectrophotometry which gave lower yields on a per cigarette basis than those found by QA with routine smoking. The method is being reviewed by Research Division.

No systematic effect of the firmness was found on the diffusion coefficient of carbon monoxide (CO). The influence of the density on the formation of CO seems more important than the changes in the diffusion rate. However, the determined diffusion coefficients are significantly lower with the cigarette paper of lower air permeability.

Plans

The cigarettes will be smoked again with the modified analytical method for determining DPM per puff to check if it influences the shape of the profile e.g. the filtration coefficient.

Another series of prototypes is planned with smaller cigarette diameter to determine its influence on the filtration of the tobacco rod.

References
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[1] E. Byckling
    Untersuchungen der Filterwirksamkeit des Tabakstranges bei Cigarettes verschiedener Härte.
    Beitr. Tabakforsch. 8 (6), 1976, p 382.

[2] T. Yamamoto et al.
    Effect of cigarette Circumference on Weight Loss during Puffs and Total Delivery of Tar and Nicotine.
    Beitr. Tabackf. Int. 12 (5), 1984, p 259

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